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EXAMINER	
TADAYYON ESLAMI, TABASSOM	
ART UNIT	PAPER NUMBER
1792	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/529,258	GUSSONE ET AL.	
	Examiner	Art Unit	
	Tabassom T. Tadayyon-Eslami	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 November 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-32* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-32* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____is/ are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-3, 5-7, 22, 26 and 28 are rejected under 35 U.S.C. 102 (b) as being anticipated by Carl Shumaker et al., (US Patent: 5650059) here after Shumaker.

Shumaker teaches,

Element having a substrate of a hard metal or cermets comprising hard material particles and binding material [column 3 line 15]

and a diamond layer [column 3 line 19],

wherein the diamond layer is disposed over a first region of intact substrate material within which hard material particles are surrounded by binding material [column 3 line 14]

wherein the transition region of the first region, which is disposed towards the diamond layer, comprises a depth profile having indents and elevations (It means the transition area is rough, [fig. 2 shows the rough transition region],

and wherein the diamond layer is braced with the substrate material such that portions of the diamond layer are disposed deeper in the substrate than elevations of the first region [fig. 2]

characterized in that:

between the first region and the diamond layer there is disposed a porous zone in which hard material particles are free of binding material [column 5, lines13-25],

and

wherein the hard material particles form an intact hard material particle structure within the porous zone and are not weakened at the grain edges by etching [the etching process that Shumaker teaches, only removes the binding materials, therefore the carbide grains will not be round and maintain sharp and intact hard [fig. 7]] .

Claim 2 is rejected since Shumaker teaches the porous zone to a depth up about 15 micron, or 1-5 micron [column 3, line 26].

Claim 5 is rejected since Shumaker discloses the substrate material contains WC particles and Co binder, wherein the binder material contains 3-12% cobalt [column 1, line 47].

Claims 3, 6, 7 and 22 are rejected. Shumaker teaches,

Element according claim 1 (it was explained previously that Shumaker teaches the limitation of claim 1) wherein the porous zone comprises an average thickness d (1-5 um)[column 3, line 28], the depth profile of the transition region of the first region comprises an average peak-to-valley height R_z and maximum peak-to-valley height R_{max} and wherein d is less than or equal to R_{max} (attached fig. 1 of Shumaker reference shows R_{max} for three of the peaks to valleys height (# 8, 9 and 10) are about the height of the porous zone, therefore, claims 3 and 22 are rejected.

Claims 6 and 26 also rejected. Further analysis of fig. 1 in Shumaker reference shows in fact the average peak-to-valley height R_z is about 7.20 um which is between 2 and 10 um.

Claim 7 is also rejected. Further analysis of fig. 1 in Shumaker reference shows in fact the average peak-to-valley height R_z is about 7.20 um which is grater than the grain size of the hard material (fig.1 shows the largest grain size is about 3.72 um) and Shumaker further teaches. Therefore claim 7 is rejected.

Claim 28 is also rejected. Further analysis of fig. 1 in Shumaker reference shows in fact the average peak-to-valley height R_z is about 7.20 um which is grater than the grain size of the hard material (fig.1 shows the largest grain size is about 3.72 um; however there are plenty of grains having less than 1 um size). Therefore claim 28 is rejected.

Claims 12, 14 and 20 are rejected under 35 U.S.C. 102(b) as being anticipated by Yixiong Liu et. al. (U.S. Patent Application: 2003/0049434), here after Liu,

Liu teaches a method for coating a substrate material with a diamond layer (wherein the substrate comprises hard material particles (WC) and surrounding binding (Co) [0008] wherein in first step a selective etching of the binding material is executed [0106],

Hard material particles are removed in a subsequent mechanical removal step by means of a blasting process with blasting particles [0109],

and the substrate in afterwards coated with a diamond layer [0110].

Claim 14 rejected since Liu teaches cleaning step (washing and rinsing) before the coating [0108].

Claim 20 rejected since Lin disclosed using solution comprising sulfuric acid [claim 17].

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Carl Shumaker et al, (U.S. Patent: 5650059) here after Shumaker.

Claim 27 is rejected for the same reason claim 6 and 26 are rejected. Although the claimed ranges and prior art does not over lap, but are close enough that one skilled in the art would have expected them to have the same properties (Titanium Metals Corp of America v. Banner) *[MPEP 2144.05 I]* . Therefore it would have been obvious to one of ordinary skill in the art at the time of invention was made to have a substrate of the average peak-to-valley height R_z is about 7 um, because Shumaker teaches it is appropriate to make this element with R_z in this range.

Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yixiong Liu et. al. (U.S. Patent Application: 2003/0049434), here after Liu, further in review of Frank H. Phillips et al (U. S. Patent: 6004189, here after Phillips).

Liu teaches a method for coating a substrate material with a diamond layer (wherein the substrate comprises hard material particles (WC) and surrounding binding (Co) [0008] wherein in first step a selective etching of the binding material is executed [0106]. He further teaches an ultrasound seeding/scratching process [0109], before depositing the diamond film [0110]. Although the seeding process is done for growing the diamond layer and the diamond particles are abrasive, during the ultrasonic process they would remove the materials from the surface as well as anchoring in the substrate, but Liu does not clearly teaches the mechanical removal particles consist of SiC. Phillips teaches polishing the WC surface with SiC [column 7, line 27]. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention was made to have a method for coating a substrate material with a diamond layer which meets the limitation of claim 12 and the blasting particles consists of SiC particles.

Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yixiong Liu et. al. (U.S. Patent Application: 2003/0049434, here after Liu), as applied to claim 12 above, further in view of Michale G. Peters et al (U. S. Patent: 5236740, here after Peters).

Liu teaches the limitation of claim 12 as explained above. Peters teaches a method of coating a substrate (Co-bonded WC) with diamond film(abstract) wherein the material-selective etching step is executed after mechanical removal step [column 4,

example 2, third sample]. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention was made to have a method for coating a substrate material with a diamond layer which meets the limitation of claim 12 and further the binding material –selective etching step is executed after the mechanical removal step because it is possible to improve the adhesion property of the diamond film to WC substrate with this method.

Claims 4 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Carl Shumaker et al., (U.S. Patent: 5650059) here after Shumaker and further in view of Geoffrey W. Meadows et. al. (U.S. Patent: 3451791) here after Meadows,

Shumaker teaches the limitation of claim 1 as discussed above, it further teaches the substrate material contains WC hard material particles and a binder containing Co [column 5, line 12]. Shumaker does not teach the grain size of the hard material particles is less than 0.8 um. Meadows further teach Cobalt bounded Tungsten carbide, where the average grain size of WC less than 0.5 um [column 4, 73]. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention was made to have a substrate of a hard metal and a diamond film over it which meet the limitation of claim 1 and further the grain size of the hard material (WC) be less than 0.5 um because it makes dense bodies of tungsten carbide.

Claim 8 - 11, 16, 18 and 29-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Deepak G. Bhat et.al. (U.S. Patent: 5713133) here after Bhat further in view of Michael G. Peters et. al. (U.S. Patent: 5236740), here after Peters,

Bhat teaches,

Method for coating a substrate material with a diamond layer wherein the substrate material contains hard material particles (WC) and binding material (Co) wherein,

A binding material –selective etching is executed in a first step, wherein the binding material in a border zone of the substrate is removed [column 5, line 4].

A hard material –selected etching is executed in a second step, wherein the hard material particles in the border zone are completely removed [column 5, line 25] so that a surface profile with elevations and indents is created [fig. 3] and the substrate coated with diamond layer thereafter [column 5, line 38],

Bhat teaches removing the binder, removing the carbide and then cleaning the surface [column 3 lines 49]. Bhat does not explicitly teaches the third step of the etching for removing the binding material concentration on the surface, however Peters discloses the etching step after etching WC grains, in order to enhance the diamond coating adhesion [abstract]. Peters teaches two steps of etching for removing the carbide particles and the second step to removes the residues from the surface [column 3 lines 39-48] which is mainly done for cleaning purposes. Therefore it is appropriate to consider the second etching step of Peters which is for the purpose of removing the residues (with removing some of the binder [column 3 lines 40-41]) as the cleaning step for Bhat. This cleaning step only removes slight (some of) cobalt binders therefore is not expected to change mechanical anchoring of the carbide particles, in fact it would improve it. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention was made to have a method for coating a substrate material with a

diamond layer wherein the substrate material contains hard material particles and binding material which the binding material will etch first following by etching the hard material particle and at last there would be a third step to remove the residues and the binding materials on surface and deposit the diamond layer, because the diamond layer will adhesion to the substrate will improve with this method.

Claim 9 is rejected, Bhat and Peters teach the limitation of claim 8 and Bhat further teach the depth of first step etching is approximately 3 microns [column 5, line 16]. Peters does not teach an etching depth for the residue removal step. However, peter disclosed the process for removing any residue remaining on the surface [column 2, line 60] and some of binders (slight etching) [column 3 line 41]. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention was made to have a method for diamond coating of a hard materials which meet the limitation of claim 8 and the third step of etching comprising lesser etching depth than the first step, because removing the surface residues means removing less than a micron (a couple mono layers) from the surface.

Claim 10 rejected since Bhat teaches the limitation of claim 8 and it further discloses using of solvent comprising caustic soda (NAOH) to etch the WC (second step of etching) [column 5, line 32].

Claim 11 rejected. Bhat and Peters teach the limitation of claim 8 and Peters further discloses using of solvent comprising sulfuric acid and hydrogen peroxide [column 6, line 16] for removing the surface residues (third step etching) [column 3, line 39]. Therefore, it would have been obvious to one of ordinary skill in the art at the time

of invention was made to have a method for coating a substrate material with a diamond layer wherein the substrate material contains hard material particles (WC) and binding material (Co) wherein the third step of etching comprises solvent comprising sulfuric acid and hydrogen peroxide

Claims 16 and 29-30 rejected. Bhat and Peters teach the limitation of claim 8 and Bhat further teaches etching depth is 6 um [table 1, the example 6].

Claim 18 rejected. Bhat and Peters teach the limitation of claim 8 and Bahat further teaches the diamond film to be deposited through CVD [abstract].

Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable Deepak G. Bhat et.al. (U.S. Patent: 5713133) here after Bhat and Michael G. Peters et. al. (U.S. Patent: 5236740), here after Peters as applied to claim 8 above, further in view of Carl Shumaker et al., (U. S. Patent: 5650059) here after Shumaker.

Bhat and Peters teach the limitation of claim 8 as explained above. They do not teach the etching of cobalt binding with hydrochloric acid and hydrogen peroxide. Shumaker however teaches a method for etching the cobalt in cobalt binding WC comprising the step of etching with solvent comprising hydrogen peroxide and hydrochloric acid [colum3, line 45]. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention was made to have a method for coating a substrate material with a diamond layer wherein the substrate material contains hard material particles and binding material which meet the limitation of claim 8 and further the first step of etching (etching the cobalt binding) would be with solvent comprising of

hydrogen peroxide and hydrochloric acid, because it is possible to remove the cobalt from C0-WC with this method.

Claims 19, 21, 31-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yixiong Liu et al (U.S. Patent Application: 2003/0049434), here after Liu as applied to claim 12 above, further in view of Deepak G. Bhat et.al (U.S. Patent: 5713133), here after Bhat.

Claims 19, 31-32 are rejected. Liu teachws the limitation of claim 12 as explained above. They don't teach the etching depth for the first step (binding removal) to be 1-20 um. Bhat teaches a method for coating a substrate material with a diamond layer wherein the substrate material contains hard material particles (WC) and binding material (Co) wherein the binding material in a border zone of the substrate is removed [column 5, line 4] and a hard material –selected etching is executed in a second step, wherein the hard material particles in the border zone are completely removed [column 5, line 25] so that a surface profile with elevations and indents is created [fig. 3] and the substrate coated with diamond layer thereafter [column 5, line 38]. Bhat further teach the depth of first step etching is approximately 3 microns [column 5, line 16]. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention was made to have a method for coating a substrate material with a diamond layer that Liu teaches where the etching depth for the first step of etching (binding removal) is about 6 micron, because Bhat teaches it is appropriate etching depth.

Claim 21 rejected. Liu teaches the limitation of claim 12 as explained above. Liu does not teach that the diamond thin film is deposited through CVD method. Bhat

further teaches a Method for coating a substrate material with a diamond layer wherein the substrate material contains hard material particles (WC) and binding material (Co) wherein the diamond layer is deposited through CVD method [abstract]. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention was made to have a method for coating a substrate material with a diamond layer which meets the limitation of claim 12 and the diamond film is deposited through CVD method because it is possible to make a diamond coated bonded tungsten carbide with this method.

Claim 24-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Carl Shumaker et al., (U. S. Patent: 5650059) here after Shumaker, further in view of Deepak G. Bhat et.al. (U.S. Patent: 5713133), here after Bhat.

Shumaker teaches the limitation of claim 5 as discussed above. He does not teach the binding material contains more than %6 (8-10%) cobalt. Bhat teaches a substrate coated with a diamond layer [abstract] wherein the substrate material contains hard material particles (WC) and binding material (Co) wherein the binding material –selective etching is executed in a first step, wherein the binding material in a border zone of the substrate is removed [column 5, line 4], and the hard material particles in the border zone are completely removed [column 5, line 25] so that a surface profile with elevations and indents is created [fig. 3] and the substrate coated with diamond layer thereafter [column 5, line 38]. He further teaches the binder (cobalt) is about 2-12%.Therefore it would have been obvious to one of ordinary skill in the art at the time of invention was made to have a method for coating a substrate material with a

diamond layer that Shumaker teaches where the binder material contains 8-10% of cobalt, because Bhat teaches it is suitable to have a cutting tool with 8-12% of cobalt binder.

Response to Argument

Applicant's arguments filed on Nov. 14, 2007 have been fully considered but they are not persuasive. The applicant argues the carbide grains are not intact, however the structure in fig. 1 shows the carbide grains are intact, otherwise the diamond layer would peel off from the substrate.

Applicant argues that Shumaker pre-treatment creates a porous zone of 10-15 um which is well above the roughness of the transition region. However Shumaker teaches the roughness of the transition zone is preferable 1-5 microns and he also teaches the carbide grains have sharp edges is susceptible to receive a diamond coating [column 5 lines 23-28]; therefore the diamond layer is braced with the substrate. In fig. 2 Shumaker shows the diamond layer disposed deeper than elevation of the firs region in the layer.

Applicant arguments regarding claims 24-25 are unconvincing in view of Bhat. Shumaker does not discloses the roughness and grain size analysis, the analysis has been done by the examiner based on the fig. 2 of Shumaker results in the amount of roughness and approximate maximum grain size.

The applicant argues Liu does not teach blasting process with abrasive particles; however Liu teaches diamond scratching/seeding process. Although it is clear that the seeding process is done for growing the diamond layer, but since the diamond particles

are abrasive, during the ultrasonic process they would mechanically remove the materials from the surface as well as anchoring in the substrate.

Applicant argues that the Bhat and Peters approaches contradict each other. However they both basically teach a method for improving the adherence of the diamond film to the WC substrate. Bhat in fact teaches two step of etching for removing the binding and the hard material and then cleaning. while he does not teach the next etching step, Peters teaches two steps of etching for removing the carbide particles and the second step to removes the residues from the surface [column 3 lines 39-48] which is mainly done for cleaning purposes. Therefore it is appropriate to consider the second etching step of Peters which is for the purpose of removing the residues (with removing some of the binder [column 3 lines 40-41]) as the cleaning step for Bhat. This cleaning step only removes slight (some of) cobalt binders therefore is not expected to change mechanical anchoring of the carbide particles, in fact it would improve it.

Conclusion

Applicant amendment necessitated the new ground (s) of rejection presented in this office action Accordingly, **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tabassom T Tadayyon-Eslami whose telephone number is 571-270-1885. The examiner can normally be reached on 7:30-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Cleveland can be reached on 571-272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MICHAEL CLEVELAND
SUPERVISORY PATENT EXAMINER